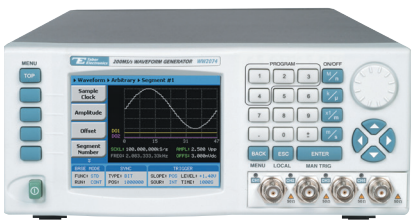
WONDER WAVE SERIES



# WW5064/1074/2074

## 50MS/s, 100MS/s or 200MS/s Four Channel Arbitrary Waveform Generators

- Four Channel waveform generators
- Sine waves to 80MHz and square to 50MHz
- 16 Bit amplitude resolution
- Up to 4M waveform memory
- 10Vp-p into 50Ωstandard, double into high impedance
- Multiple run modes: trigger, timer and trigger delay
- Four separate SYNC outputs
- Powerful sequence generator links and loops segments in user-defined fashion. Stores up to 10 different sequence tables
- High resolution 3.8” LCD, color display
- LAN, USB and GPIB interfaces
- Multi-Instrument synchronization
- ArbConnection software for easy waveform creation

The WW5064/1074/2074 offer a 50/100/200 MS/s four-channel universal waveform synthesizer. Each is built in a small case size to save space and cost but without compromising bandwidth and signal integrity. The instrument outputs either standard or user-defined waveforms in the range of 100µHz and up to 80MHz in the 200MS/s model. 16-bit DAC's are used for building waveforms with excellent accuracy and resolution which are suitable for the finest test signals that are needed for today's sensitive instruments. Using the latest technology, you can be assured that the features and capabilities of the four channel models will be useful for many years.

### Signal Integrity

As technology is evolving and new devices are developed every day, faster signals are needed to simulate and stimulate these new devices. The four channel models provide the highest bandwidth in their class and hence provide accurate duplication and simulation of test signals. With a wide range of sample clock generators (up to 200MS/s), 16-bit vertical resolution and wide output bandwidth (up to 80MHz), one can create mathematical profiles, download the coordinates to the instrument and re-generate waveforms without compromising their fidelity and compatibility to the original design.

### Four Synchronized Channels

The four channels models have four output channels which are all synchronized to the same reference clock and share the same sample clock. This is not a limitation because the output frequency is a function of the number of points which are used for creating the waveform shape. On the other hand, the advantage of having four synchronized channels is huge in applications that require accurate and controlled phase between channels. Many applications require XY drive so two channels is just what is needed however, for three phase power simulation and four channel MEMS micro engine actuators, the four channel model is the most suitable product to use.

### High Speed Function Generator

Care to use the instrument as a function generator? No need to fuss with loading complex waveform coordinates, simply select the standard waveforms tab and start generating any one of the ten waveforms that are pre-computed and available for immediate use. Included are: sine, triangle, square, pulse, ramp, sinc and others.

### Stable and Accurate Output Signals

As standard, the instrument is equipped with a frequency reference that has 1ppm accuracy and stability over a period of 1 year. An external frequency reference is provided on the rear panel for applications requiring greater accuracy and stability.

### Easy to use

Large and user-friendly 3.8” back-lit color LCD display facilitates browsing through menus, updating parameters and displaying detailed and critical information for your waveform output. Combined with numeric keypad, cursor position control and a dial, the front panel controls simplify the often

# WW5064/1074/2074

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complex operation of an arbitrary waveform generator.Waveform Memory and Memory Segmentation Waveform memory is the internal "black board" where the waveforms are created and reside. Large memory bank provides for longer waveforms. One can use the entire memory for a single waveform or split the length to smaller segments. In this case, many waveforms can be stored in the same memory and replayed, one-at-a-time, when recalled to the output. The memory segmentation is combined with a sequence generator that can take different memory segments and link (and loop) them in any order as required for the test. The ability to loop waveform segments in a sequence saves a lot of memory space and hence, extends the capability of the generator to produce complex and much longer waveforms, which would otherwise require large banks of memory. The four channel models have four sequence generators that can be designed to generate unique sequences for each output channel.

### Remote Control

Access speed is an increasingly important requirement for test systems. Included with each instrument is a variety of interfaces: Ethernet, USB and GPIB so one may select the most suitable interface for the application. Remote control of instrument functions, parameters and waveform download is easily tailored to specific system environment regardless if it is just a laptop to instrument or full-featured ATE system. IVI drivers and factory support will speed up system integration and hence minimize time-to-market as well as significantly reduce system development costs.

### Remote Calibration

Normal calibration cycles in the industry range from one to three years where instruments are sent to a service center, opened to allow access to trimmers, calibrated and certified for repeated usage. Leading-edge technology was implemented to allow calibration from any interface, USB, GPIB or LAN. Calibration factors are stored in a flash memory thus eliminating the need to open instrument covers.

### Multiple Environments to Write Your Code

All models come with a complete set of drivers, allowing you to write your application in various environments such as: Labview, CVI, C++, VB, and MATLAB. You may also link the supplied dll to other Windows based API's or, use low level SCPI commands (Standard Commands for Programmable Instruments) to program the instrument, regardless if your application is written for Windows, Linux or Macintosh operating systems.

### Multi-Instrument Synchronization

Multiple four channel models (of the same SCLK speed) can be synchronized using a Master-Slave arrangement allowing users to benefit from the same high quality performance in their multi-channels system.

### ArbConnection

The ArbConnection software provides you with full control of instrument functions, modes and features. ArbConnection is a powerful editorial tool that allows you to easily design any type of waveform. Whether it is the built in wave, pulse or serial data composers, or the built in equation editor with which you can create your own exotic functions, with ArbConnection virtually any application is possible.

# WW5064/1074/2074

## 50MS/s, 100MS/s or 200MS/s Four Channel Arbitrary Waveform Generators

## Specification

### CONFIGURATION

| | |
|---|---|
| Output Channels | 4, semi-independent |

### STANDARD WAVEFORMS

| | |
|---|---|
| Waveforms: | Sine, Triangle, Square, Pulse, Ramp, Sine(x)/x, Gaussian, Exponential, Repetitive Noise and DC |
| Frequency Range: | |
| Sine | 100µHz to 25MHz (WW5064) |
| | 100µHz to 50MHz (WW1074) |
| | 100µHz to 80MHz (WW2074) |
| Square, Pulse | 100µHz to 12.5MHz (WW5064) |
| | 100µHz to 25MHz (WW1074) |
| | 100µHz to 50MHz (WW2074) |
| All others | 100µHz to 6.25MHz (WW5064) |
| | 100µHz to 12.5MHz (WW1074) |
| | 100µHz to 25MHz (WW2074) |

### SINE

| | |
|---|---|
| Start Phase: | 0-360° |
| Phase Resolution: | 0.01° |
| Harmonics Distortion, 3Vp-p (typ.): | |
| DC to 2.5MHz | <-55dBc |
| 2.5MHz to 25MHz | <-50dBc |
| 25MHz to 40MHz | <-40dBc |
| 40MHz to 80MHz | <-35dBc |
| Non-Harmonic Distortion: | |
| DC to 50MHz | <-70dBc |
| 50MHz to 80MHz | <-65dBc |
| Total Harmonic Distortion: | |
| DC to 100kHz | 0.1% |
| Flatness (1kHz)(typical): | |
| DC to 1MHz | 1% |
| 1MHz to 10MHz | 3% |
| 10MHz to 25MHz | 5% |
| 25MHz to 80MHz | 10% |
| Phase Noise (8 points Sine, Max. SCLK) | |
| 100Hz Offset | -80dBc/Hz |
| 1kHz Offset | -89dBc/Hz |
| 10kHz Offset | -92dBc/Hz |
| 100kHz Offset | -112dBc/Hz |
| 1MHz Offset | -140dBc/Hz |

### TRIANGLE

| | |
|---|---|
| Start Phase Range: | 0-360° |
| Phase Resolution: | 0.01° |
| Timing Ranges: | 0%-99.9% of period |

### SQUARE

| | |
|---|---|
| Duty Cycle Range: | 0% to 99.9% |
| Timing Ranges: | 0%-99.9% of period |
| Rise/Fall Time: | <4ns (typ.) |
| Aberration: | <5%+10mV |

### SINC (Sine(x)/x)

| | |
|---|---|
| "0 Crossings": | 4-100 |

### GAUSSIAN

| | |
|---|---|
| Time Constant: | 10-200 |

### EXPONENTIAL PULSE

| | |
|---|---|
| Time Constant: | -100 to 100 |

### DC

| | |
|---|---|
| Range: | -5V to 5V |

### PULSE

| | |
|---|---|
| Pulse Mode: | Single or double, programmable |
| Polarity: | Normal, inverted or complement |
| Period: | |
| WW5064 | 80ns to 1000s |
| WW1074 | 40ns to 1000s |
| WW2074 | 20ns to 1000s |
| Resolution: | |
| WW5064 | 20ns |
| WW1074 | 10ns |
| WW2074 | 5ns |
| Pulse Width: | |
| WW5064 | 40ns to 1000s |
| WW1074 | 20ns to 1000s |
| WW2074 | 10ns to 1000s |
| Rise/Fall Time: | |
| Fast | <4ns, typ. (WW5064) |
| | <6ns, typ. (WW1074) |
| | <8ns, typ. (WW2074) |
| Linear | 20ns to 1000s (WW5064) |
| | 10ns to 1000s (WW1074) |
| | 5ns to 1000s (WW2074) |
| High Time, Delay & Double Pulse Delay: | 20ns to 1000s (WW5064) |
| | 10ns to 1000s (WW1074) |
| | 5ns to 1000s (WW2074) |
| Impedance: | 50Ω |
| Amplitude Window: | 10mVp-p to 10Vp-p(1) |
| Low Level | -5V to +4.995V (1) |
| High Level | -4.995V to +5V (1) |
| (1) | Double into high impedance |

NOTES:

1. All pulse parameters, except rise and fall times, may be freely programmed within the selected pulse period provided that the ratio between the period and the smallest incremental unit does not exceed the ratio of 1,000,000 to 1. With the 2M/4M option, the ratio is extended to 2,000,000 (4,000,000) to 1, hence the specifications below do not show maximum limit as each must be computed from the above relationship.
2. Rise and fall times, may be freely programmed provided that the ratio between the rise/fall time and the smallest incremental unit does not exceed the ratio of 100,000 to 1.
3. The sum of all pulse parameters must not exceed the pulse period setting

### HALF-CYCLE WAVEFORMS

| | |
|---|---|
| Function Shape: | Sine, Triangle, Square |
| Frequency Range: | 0.01Hz to 1MHz |
| Phase (Sine/triangle): | 0 to 360° |
| Phase Resolution: | 0.01° |
| Duty Cycle Range: | 0% to 99.9% |
| Run Modes: | Continuous, Triggered |
| Delay Between Half Cycles (Continuous only): | 200ns to 20s |
| Delay Resolution | 20ns |

### ARBITRARY WAVEFORMS

| | |
|---|---|
| Sample Rate: | |
| WW5064 | 1.5S/s to 50MS/s |
| WW1074 | 1.5S/s to 100MS/s |
| WW2074 | 1.5S/s to 200MS/s |
| Vertical Resolution: | 16 Bits |
| Waveform Memory: | |
| WW5064 | 512k points (1M optional) |
| WW1074/WW2074 | 1M points (2M/4M optional) |
| Min. Segment Size: | 16 points |
| Resolution: | 4 points |
| No. of Segments: | 1 to 10k |

### SEQUENCED WAVEFORMS

| | |
|---|---|
| Operation: | Segments may be linked and repeated in a user-selectable order to generate extremely long waveforms. Segments are advanced using either a command or a trigger |
| Multi Sequence: | 1 to 10, Selectable |
| Sequencer Steps: | 1 to 4k |
| Segment Duration: | 600ns min. |
| Segment Loops: | 1 to 1M |

### ADVANCE MODES

| | |
|---|---|
| Automatic: | No triggers required to step from one segment to the next. Sequence is repeated continuously through a pre-programmed sequence table |
| Stepped: | Current segment is sampled continuously, external trigger advances to next programmed segment. |
| Single: | Current segment is sampled to the end of the segment including repeats and idles there. Next trigger advances to next segment |
| Mixed: | Each step of a sequence can be programmed to advance either: a) automatic (Automatic mode), or b) with a trigger (Stepped mode) |
| Advance Source: | External (TRIG IN), Internal or software |

# WW5064/1074/2074

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## Specification

### COMMON CHARACTERISTICS

#### FREQUENCY

| | |
|---|---|
| **Resolution:** | |
| Display | 11 digits (limited by 1µHz) |
| Remote | 14 digits (limited by 1µHz) |
| **Accuracy/Stability:** | Same as reference |

#### ACCURACY REFERENCE CLOCK

| | |
|---|---|
| Internal | 0.0001% (1 ppm TCXO) initial tolerance over a 19°C to 29°C temperature range; 1ppm/°C below 19°C and above 29°C; 1ppm/year aging rate |
| External | 10MHz TTL, 50% ±2%, or 50Ω ±5% 0dBm (jumper) |

#### AMPLITUDE

| | |
|---|---|
| **Range:** | 10mV to 10Vp-p into 50Ω; Double into open circuit |
| **Resolution:** | 4 digits |
| **Accuracy (1kHz):** | |
| 16mV to 160mVp-p | ±(1% + 5mV) |
| 160mV to 1.6Vp-p | ±(1% + 10mV) |
| 1.6V to 10Vp-p | ±(1% + 70mV) |

#### OFFSET

| | |
|---|---|
| **Range:** | 0 to ±4.995V, into 50Ω |
| **Resolution:** | 1mV |
| **Accuracy:** | ±(1%+1% of Amplitude +5mV) |

#### FILTERS

| | |
|---|---|
| **Type:** | |
| Bessel | 25MHz or 50MHz |
| Elliptic | 60MHz or 120MHz |

### OUTPUTS

#### MAIN OUTPUT

| | |
|---|---|
| **Coupling:** | DC coupled |
| **Connector:** | Front panel BNC |
| **Impedance:** | 50Ω ±1% |
| **Protection:** | Short Circuit to Case Ground, 10s max |

#### SYNC OUTPUT

| | |
|---|---|
| **Connector:** | Rear panel BNC |
| **Level:** | TTL |
| **Sync Type:** | |
| Pulse | Arbitrary and Standard waves |
| LCOM | Sequence and Burst modes |
| **Position:** | |
| WW5064 | 0 to 512k (1M optional) |
| WW1074/2074 | 0 to 1M (2M or 4M optional) |
| **Resolution:** | 4 points |

#### SAMPLE CLOCK OUTPUT

| | |
|---|---|
| **Connector:** | Rear panel SMB |
| **Level:** | 400mVp-p |
| **Impedance:** | 50Ω |

#### COUPLE OUTPUT

| | |
|---|---|
| **Connector:** | Rear panel SMB |
| **Level:** | LVPECL |
| **Impedance:** | 50Ω, terminated to +1.3V |

### INPUTS

#### TRIGGER INPUT

| | |
|---|---|
| **Connector:** | Rear panel BNC |
| **Input Impedance:** | 10kΩ |
| **Polarity:** | Positive or negative, selectable |
| **Level:** | ±5V |
| **Sensitivity:** | 100mV |
| **Damage Level:** | ±12V |
| **Min. Pulse Width:** | 10ns |

#### EXTERNAL REFERENCE INPUT

| | |
|---|---|
| **Connector:** | Rear panel SMB |
| **Frequency:** | 10MHz |
| **Impedance & Level:** | |
| Default | 10kΩ ±5%, TTL, 50% ±2% |
| Option | 50Ω ±5%, 0dBm Sinewave |

#### SAMPLE CLOCK INPUT

| | |
|---|---|
| **Connector:** | Rear panel SMB |
| **Range:** | |
| WW5064 | 1.5Hz to 50MHz |
| WW1074 | 1.5Hz to 100MHz |
| WW2074 | 1.5Hz to 200MHz |
| **Input Level:** | 300mVp-p to 1Vp-p |
| **Impedance:** | 50kΩ |
| **Min. Pulse Width:** | 4 ns |

#### COUPLE INPUT

| | |
|---|---|
| **Connector:** | Rear panel SMB |
| **Input Level:** | LVPECL |
| **Impedance:** | 50Ω, terminated to +1.3V |
| **Min. Pulse Width:** | 4 ns |

### RUN MODES

| | |
|---|---|
| **Continuous:** | Free-run output of a waveform. |
| **Triggered:** | Upon trigger, outputs one waveform cycle. Last cycle always completed. |
| **Gated:** | External signal transition enables or disables generator output. Last cycle always completed |
| **Burst:** | Upon trigger, outputs a Dual or multiple pre-programmed number of waveform cycles from 1 through 1M. |
| **Mixed:** | First output cycle is initiated by a software trigger. Consequent output requires external triggers through the rear panel TRIG IN |

### TRIGGER CHARACTERISTICS

| | |
|---|---|
| **System Delay:** | 6 SCLK + 150ns |
| **Trigger Delay:** | [(0; 200ns to 20s)+system delay] |
| **Trigger Resolution:** | 20ns |
| **Trigger Delay Error:** | 6 SCLK + 150ns |

#### EXTERNAL

| | |
|---|---|
| **Source:** | Rear panel BNC |
| **Trigger Level:** | ±5V |
| **Resolution:** | 1mV |
| **Input Frequency:** | DC to 2.5MHz |
| **Min. Pulse Width:** | 10ns |
| **Slope:** | Positive/Negative, selectable |
| **Trigger Jitter:** | ±1 sample clock period |

#### INTERNAL / TIMER

| | |
|---|---|
| **Range:** | 200ns to 20s |
| **Resolution:** | 20ns |
| **Error:** | 3 sample clock cycles+20ns |

#### MANUAL

| | |
|---|---|
| **Source:** | Soft trigger command from the front panel or remote |

### FREQUENCY COUNTER / TIMER

| | |
|---|---|
| **Measurements:** | Frequency, Period, Averaged Period, Pulse Width & Totalize |
| **Source:** | Trigger Input |
| **Range:** | 10Hz to 100MHz (typ.120MHz) |
| **Sensitivity:** | 500mVpp |
| **Accuracy:** | 1ppm |
| **Slope:** | Positive/Negative transitions |
| **Gate Time:** | 100µSec to 1 Sec |
| **Input Range:** | ±5V |
| **Trigger Modes:** | Continuous, Hold and Gated |
| **Period Averaged:** | |
| Range | 10ns to 50ms |
| Resolution | 7 digits / Sec |
| **Period and Pulse Width:** | |
| Range | 500ns to 50ms |
| Resolution | 100ns |
| **Totalize:** | |
| Range | $10^{12}$-1 |
| Overflow | Led indication |

# WW5064/1074/2074

## 50MS/s, 100MS/s or 200MS/s Four Channel Arbitrary Waveform Generators

## Specification

### INTER-CHANNEL DEPENDENCY

| | |
|---|---|
| **Separate controls:** | Output on/off, amplitude, offset, standard waveforms, user waveforms, user waveform size, sequence table |
| **Common Controls:** | Sample clock (Arb), frequency (Std), period (Pulse) reference source, trigger modes, trigger advance source, SYNC OUT. |

### PHASE OFFSET (LEADING EDGE)

| | |
|---|---|
| **DESCRIPTION:** | Channel 1 used as start reference channel 2, 3 and 4 can be offset by a programmable number of points. Channels 3&4 must have the same duration in one of the following run modes: Triggered, Burst, or gated. |
| **Jitter Between Channels:** | 0ps |
| **Offset Range:** | |
| WW5064 | 0 to ±512k points (1M opt.) |
| WW1074/WW2074 | 0 to ±1M points (2M/4M opt.) |
| **Reference:** | Each CH. in reference to CH 1 |
| **Resolution and Accuracy:** | |
| Channels 1/2 | 1 point |
| Channels 3/4 | 4 points |
| **Initial Skew:** | <1ns |
| Error | 1 SCLK |

### MULTI-INSTRUMENT SYNCHRONIZATION

| | |
|---|---|
| **Initial Skew:** | <25 ns + 1 SCLK |
| **Waveform Types:** | Standard, Arbitrary and Sequenced using the automatic sequence advance mode only |
| **Run Modes:** | Continuous, Triggered, Gated and Counted Burst |

### LEADING EDGE OFFSET

| | |
|---|---|
| **Run Mode:** | Continuous run mode only |
| **Offset Range:** | 200ns to 20s |
| **Resolution:** | 20ns |

### GENERAL

| | |
|---|---|
| **Voltage Range:** | 85 to 265V |
| **Frequency Range:** | 48 to 63Hz |
| **Power Consumption:** | 60W |
| **Display Type:** | Color LCD, back-lit |
| Size | 3.8" reflective |
| Resolution | 320 x 240 pixels, |
| **Interfaces:** | |
| USB Device | 1 x rear, USB device, (A type) |
| LAN | 100/10 BASE-T |
| GPIB | IEEE 488.2 standard interface |
| **Dimensions:** | |
| With Feet | 212 x 102 x 415mm (WxHxD) |
| Without Feet | 212 x 88 x 415mm (WxHxD) |
| **Weight:** | |
| Without Package | 3.5Kg |
| Shipping Weight | 4Kg |
| **Temperature:** | |
| Operating | 0°C - 50°C |
| Storage | -40°C to + 70°C. |
| **Humidity:** | |
| 11°C - 30°C | 85% |
| 31°C - 40°C | 75% |
| 41°C - 50°C | 45% |
| **Safety:** | EN61010-1, 2nd revision |
| **Calibration:** | 1 year |
| **Warranty [1]:** | 5 years standard |

### ORDERING INFORMATION

| MODEL | DESCRIPTION |
|---|---|
| **WW5064** | 50MS/s Four Channel Arbitrary Waveform Generator |
| **WW1074** | 100MS/s Four Channel Arbitrary Waveform Generator |
| **WW2074** | 200MS/s Four Channel Arbitrary Waveform Generator |

### OPTIONS

| | |
|---|---|
| **WW5064:** | |
| **Option 1:** | 1M Memory (per channel |
| **WW1074/WW2074:** | |
| **Option 1:** | 2M Memory (per channel) |
| **Option 2:** | 4M Memory (per channel) |

### ACCESSORIES

| | |
|---|---|
| **Sync Cable:** | Multi-instrument synchronization |
| **S-Rack Mount:** | 19" Single Rack Mounting Kit |
| **D-Rack Mount:** | 19" Dual Rack Mounting Kit |
| **Case Kit:** | Professional Carrying Bag |

**Note:** Options and Accessories must be specified at the time of your purchase.

[1] Standard warranty in India is 1 year.